CLAIMS

What is claimed is:

1. A method for producing a cushioning element comprising the steps of:

(a) forcing molten gel into and through an extrusion die wherein said extrusion die includes forming rods, an aperture and an aperture periphery;

(i) where said forming rods are within said aperture and where said forming rods have an appearance similar to that of the desired cushioning element except that portions of said extrusion die that are solid will be represented by air in the finished cushioning element and portions of said extrusion die that are unobstructed will be represented by solidified gel in the finished cushioning element;

(ii) where the spacing of said forming rods approximates the spacing of columns in the finished cushioning element and the shape and size of said aperture periphery approximates the shape and size of the desired cushioning element;

(b) cutting said gel as it leaves said extrusion die; and

(c) allowing said cut gel to cool in a cooling medium in order to solidify said gel and thus form a cushioning element;

wherein said extrusion die is configured to produce a cushioning element having a plurality of buckling columns formed in said solidified gel.

2. The method for producing a cushioning element as recited in claim 1, wherein a cross section of at least one of said columns taken orthogonal to said longitudinal axis of said column has a shape selected from the group consisting of triangular, square, rectangular, pentagonal, heptagonal, octagonal, round, oval, and n-sided polygonal where n is an integer.

3. The method for producing a cushioning element as recited in claim 1, wherein said molten gel includes elastomer gel pre-compounded at a temperature of about 470 degrees Fahrenheit and said forcing of said molten gel through said extrusion die is at about 425 degrees Fahrenheit.

4. The method for producing a cushioning element as recited in claim 3, wherein said pre-compounding and said forcing is done with an extruder screw.

5. The method for producing a cushioning element as recited in claim 1, wherein pressure in said extrusion die is from 200 to 4000 pounds per square inch.

6. The method for producing a cushioning element as recited in claim 1, wherein said cooling medium is water.

7. The method for producing a cushioning element as recited in claim 6, wherein the direction of said extrusion is upward into said water.

8. The method for producing a cushioning element as recited in claim 6, wherein the direction of said extrusion is downward into said water.

9. A cushioning element made according to the method of claim 1, the cushioning element comprising:

(a) a quantity of said solidified gel formed to have a top, a bottom, and an outer periphery, said solidified gel being compressible so that it will deform under the compressive force of a cushioned object,

(b) the cushioning element being adapted to have a cushioned object placed in contact with said top; wherein each of said column ends is positioned at two different points of said column axis;

(c) at least one of said columns being positioned within said solidified gel such that said column axis is positioned generally parallel to the direction of a compressive force exerted on the cushioning element by a cushioned object in contact with said solidified gel; and

(d) in at least one of said column walls being capable of buckling beneath a protuberance that is located on the cushioned object.

10. A method for producing a cushioning element comprising the steps of:

forcing molten gel through an extrusion die having an aperture periphery, an aperture, and a forming rod; said forming rod being located within said aperture;

cutting said gel as it exits said extrusion die,

cooling said molten in a cooling medium to form a cushioning element,

said cushioning element including hollow columns, each column having a column wall, and

bonding at least two of said columns together to form a bonded cushioning element, the cushioning element having a plurality of

said columns, each of said columns having a longitudinal axis along its length, each of said columns having a column wall which defines a column interior, and each of said columns having two ends and wherein said columns are capable of buckling.

11. The method for producing a cushioning element as recited in claim 10, wherein said bonding comprises:

(a) melting a portion of said column walls;

(b) contacting melted portions of said column walls;

(c) allowing said melted portions of said column walls to fuse together;

(d) allowing said column walls to solidify.

12. The method for producing a cushioning element as recited in claim 11, wherein said bonding further comprises:

(a) use of heating cores wherein said heating cores comprise heating edges positioned within said columns and in contact with said portions of said column walls to be melted;

(b) heating said heating cores to a temperature sufficient to melt said solidified gel to create molten gel;

(c) sustaining the heat until the contacted portions of said portions of said column walls are molten and fuse with neighboring molten said portions of said column walls;

(d) cooling said molten gel to re-form said solidified gel.

13. The method for producing a cushioning element as recited in claim 10, wherein a cross section of said columns taken orthogonal to said longitudinal axis of said column has a shape selected from the group consisting of triangular, square, rectangular, pentagonal, heptagonal, octagonal, round, oval, and n-sided polygonal where n is an integer.

14. The method for producing a cushioning element as recited in claim 12, wherein said temperature is not high enough to burn said solidified gel or said molten gel.

15. The method for producing a cushioning element as recited in claim 12, wherein said heating core is coated with a non-stick surface.

16. The method for producing a cushioning element as recited in claim 13, wherein said non-stick surface is Teflon.

17. The method for producing a cushioning element as recited in claim 12, wherein said heating core holds outer surfaces of said columns against one another.

18. The method for producing a cushioning element as recited in claim 12, wherein securing cores secure said columns from sliding side-to-side in relation to one another.

19. The method for producing a cushioning element as recited in claim 18, wherein said securing cores have a non-stick surface.

20. The method for producing a cushioning element as recited in claim 19, wherein said non-stick surface includes Teflon paper.

21. The method for producing a cushioning element as recited in claim 12, wherein said columns have a square shape in cross section through the longitudinal axis and wherein said contacted portions are inner surface corners of said columns.

22. The method for producing a cushioning element as recited in claim 21, wherein said heating cores hold outer surfaces of said corners against one another.

23. The method for producing a cushioning element as recited in claim 2221, wherein securing cores secure said columns from sliding side-to-side in relation to one another.

24. The method for producing a cushioning element as recited in claim 2323, wherein said securing cores have non-stick surfaces.

25. The method for producing a cushioning element as recited in claim 24, wherein said non-stick surface includes Teflon paper.

26. The method for producing a cushioning element as recited in claim 10, wherein said molten gel includes elastomer gel pre-compounded at a temperature of about 470 degrees Fahrenheit and said forcing of said molten gel through said extrusion die is at about 425 degrees Fahrenheit before said cooling occurs.

27. The method for producing a cushioning element as recited in claim 26, wherein said pre-compounding and said forcing is done with an extruder screw.

28. The method for producing a cushioning element as recited in claim 10, wherein pressure in said extrusion die is from about 200 to about 4000 pounds per square inch.

29. The method for producing a cushioning element as recited in claim 10, wherein extrusion is conducted into water.

30. The method for producing a cushioning element as recited in claim 29, wherein the direction of said extrusion is upward into said water.

31. A cushioning element made according to the method recited in claim 10, the cushioning element comprising:

(a) a quantity of said solidified gel formed to have a top, a bottom, and an outer periphery, said solidified gel being compressible so that it will deform under the compressive force of a cushioned object,

(b) wherein the cushioning element is adapted to have a cushioned object placed in contact with said top; wherein each of said column ends is positioned at two different points of said column axis;

(c) wherein at least one of said columns is positioned within said solidified gel such that said column axis is positioned generally parallel to the direction of a compressive force exerted on the cushioning element by a cushioned object in contact with said cushioning medium;

(d) and wherein at least one of said column walls is capable of buckling beneath a protuberance that is located on the cushioned object.

32. A method for producing a cushioning element wherein the cushioning element includes a flexible, resilient, solidified gel having shape memory and being substantially solid and non-flowable at temperatures below 130 degrees Fahrenheit, comprising the steps of:

forcing molten gel through an extrusion die that has forming rods, an aperture and an aperture periphery, the extrusion die being shaped to extrude an elastomer gel into a cushioning element with buckling columns,

cutting said gel as it exits said extrusion die, and

cooling said cut gel in a liquid cooling medium until it solidifies for further handling.

33. The method for producing a cushioning element as recited in claim 32, wherein said molten gel includes elastomer gel pre-compounded at a temperature of about 470 degrees Fahrenheit and said forcing of said molten gel through said extrusion die is at about 425 degrees Fahrenheit before said cooling occurs.

34. The method for producing a cushioning element as recited in claim 33, wherein said pre-compounding and said forcing is done with an extruder screw.

35. The method for producing a cushioning element as recited in claim 32, wherein pressure in said extrusion die is from 200 to 4000 pounds per square inch.

36. The method for producing a cushioning element as recited in claim 3232, wherein extrusion is into water.

37. The method for producing a cushioning element as recited in claim 3636, wherein said extrusion takes place in an upward direction into said water.

38. The method for producing a cushioning element as recited in claim 32, wherein a cross section of one of said columns taken orthogonal to said longitudinal axis of said column has a shape selected from the group consisting of triangular, square, rectangular, pentagonal, heptagonal, octagonal, round, oval, and n-sided polygonal where n is an integer.

39. A method for producing a cushioning element wherein the cushioning element includes a flexible, resilient, solidified gel having shape memory and being substantially solid and non-flowable at temperatures below 130 degrees Fahrenheit comprising the steps of:

(a) forcing molten gel through an extrusion die having an aperture periphery , an aperture, and a forming rod;

(i) where said aperture periphery is a shape that will produce columns during an elastomer extrusion process; and

(ii) where said forming rod is within said aperture;

(b) cooling said molten gel as it traverses through said extrusion die causing said molten gel to become said solidified gel during or at some time following its departure from said extrusion die, thereby creating a tube;

(c) cutting said tube as it leaves said extrusion die, wherein cut tubes comprise said columns wherein said columns are hollow; and

(d) bonding said columns together to form the cushioning element.

40. The method for producing a cushioning element as recited in claim 39, wherein said bonding step comprises:

melting a portion of said column walls;

contacting melted portions of said column walls;

allowing said melted portions of said column walls to fuse together; and

allowing said column walls to solidify fused walls.

41. The method for producing a cushioning element as recited in claim 40, wherein said bonding step further comprises:

use of heating cores wherein said heating cores comprise heating edges positioned within said columns and in contact with said portions of said column walls to be melted;

heating said heating cores to a temperature sufficient to melt said solidified gel to create molten gel;

sustaining the heat until the contacted portions of said portions of said column walls are molten and fuse with neighboring molten said portions of said column walls;

cooling the molten gel to re-form solidified gel.

42. The method for producing a cushioning element as recited in claim 41, wherein said heating core holds outer surfaces of said columns against one another.

43. The method for producing a cushioning element as recited in claim 41, wherein securing cores secure said columns from sliding side-to-side in relation to one another.

44. The method for producing a cushioning element as recited in claim 4343, wherein said securing cores have non-stick surfaces.

45. The method for producing a cushioning element as recited in claim 4444, wherein said non-stick surfaces include Teflon paper.

46. The method for producing a cushioning element as recited in claim 4141, wherein said columns have a square shape in cross section through the longitudinal axis and wherein said contacted portions are inner surface corners of said columns.

47. The method for producing a cushioning element as recited in claim 4646, wherein said wherein said heating cores hold outer surfaces of corners against one another.

48. The method for producing a cushioning element as recited in claim 4646, wherein securing cores secure said columns from sliding side-to-side in relation to one another.

49. The method for producing a cushioning element as recited in claim 48, wherein said securing cores include non-stick surfaces.

50. The method for producing a cushioning element as recited in claim 49, wherein said non-stick surfaces include Teflon paper.

51. The method for producing a cushioning element as recited in claim 41, wherein said temperature is not high enough to burn said solidified or molten gel.

52. The method for producing a cushioning element as recited in claim 4141, wherein said heating core is coated with a non-stick coating.

53. The method for producing a cushioning element as recited in claim 52, wherein said non-stick coating includes Teflon.

54. The method for producing a cushioning element as recited in claim 3939, wherein said molten gel includes elastomer gel pre-compounded at a temperature of nto less than about 470 degrees Fahrenheit and said forcing of said molten gel through said extrusion die is at not less than about about 425 degrees Fahrenheit before said cooling occurs.

55. The method for producing a cushioning element as recited in claim 5454, wherein said pre-compounding and said forcing is done with an extruder screw.

56. The method for producing a cushioning element as recited in claim 39, wherein pressure in said extrusion die is from about 200 to about 4000 pounds per square inch.

57. The method for producing a cushioning element as recited in claim 3939, wherein extrusion takes place into water.

58. The method for producing a cushioning element as recited in claim 5757, wherein said extrusion is upward into said water.

59. The method for producing a cushioning element as recited in claim 5757, wherein said extrusion is downward into said water.

60. The method for producing a cushioning element as recited in claim 39, wherein a cross section of said tubes has a shape selected from the group consisting of triangular, square, rectangular, pentagonal, heptagonal, octagonal, round, oval, and n-sided polygonal where n is an integer.